Embryonic stem cell-specific microRNAs regulate the G1-S transition and promote rapid proliferation.

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Public Summary:

Scientific Abstract:
Dgcr8 knockout embryonic stem (ES) cells lack microprocessor activity and hence all canonical microRNAs (miRNAs). These cells proliferate slowly and accumulate in G1 phase of the cell cycle. Here, by screening a comprehensive library of individual miRNAs in the background of the Dgcr8 knockout ES cells, we report that multiple ES cell-specific miRNAs, members of the miR-290 family, rescue the ES cell proliferation defect. Furthermore, rescued cells no longer accumulate in the G1 phase of the cell cycle. These miRNAs function by suppressing several key regulators of the G1-S transition. These results show that post-transcriptional regulation by miRNAs promotes the G1-S transition of the ES cell cycle, enabling rapid proliferation of these cells. Our screening strategy provides an alternative and powerful approach for uncovering the role of individual miRNAs in biological processes, as it overcomes the common problem of redundancy and saturation in the miRNA system.